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FISCAL POLICY, INTEREST RATES, AND EXCHANGE RATES:

SOME SIMPLE ANALYTICS

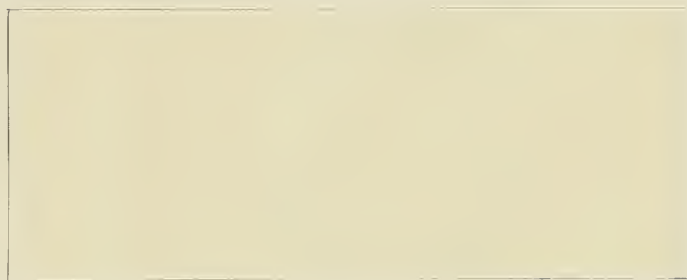
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Number 391

August 1985

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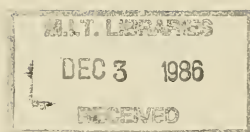
FISCAL POLICY, INTEREST RATES, AND EXCHANGE RATES:

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Fiscal Policy, Interest Rates, and Exchange Rates:

Some Simple Analytics

The so-called "Feldstein doctrine," which attributes both high US real interest rates and the strong real dollar to expansionary US fiscal policy, has been widely accepted as a working hypothesis. Suprisingly, however, there have been few simple presentations of the analytical basis for this doctrine. The purpose of this note is to provide a simple analytical exposition of the role of fiscal policy in an integrated world economy; in addition, I offer a back-of-the-envelope quantitative assessment.

The model on which this exposition is based is a direct formalization of the famous Feldstein presentation to the Council on Foreign Relations (Feldstein 1983). Recently Branson (1985) has presented a lucid analysis of the effects of fiscal policy in an open economy, and this note draws directly on his paper. The only difference is that where Branson assumes that his country cannot affect foreign real interest rate - an unsatisfactory assumption for the US - I allow for full international repercussions.

I. The Model

A. Assumptions

We consider a world of two countries, the US and the rest of the world (ROW). Each country's monetary authority is assumed to pursue a policy of

pegging real gross national product; this allows us to ignore monetary factors and state the model wholly in real terms.

We begin with the goods market. The condition of goods market equilibrium in an open economy can be expressed as

$$(1) \quad S - I = X - M$$

That is, the excess of domestic savings over investment (or, what is the same thing, the excess of income over spending), must equal the trade surplus. The left hand side of (1) will be increasing in the real interest rate; the right-hand side will be increasing in the real exchange rate. I will state both sides as shares of GNP and write the equilibrium conditions as

$$(2) \quad \gamma(r - \bar{r}) - z = \delta e$$

$$(3) \quad \gamma^*(r^* - \bar{r}^*) - z^* = -\delta^* e$$

where r , r^* are the real interest rates in US and ROW; z , z^* are shift factors to represent fiscal policy; and e is the log of the real exchange rate, defined as the price of ROW goods relative to US goods.

Since the US trade surplus is ROW's deficit, the parameters δ and δ^* are not independent. In particular, we must have

$$(4) \quad \sigma\delta = (1 - \sigma)\delta^*$$

where σ is the initial US share in gross world product.

Turning next to the asset markets, I follow Branson (1985) in assuming that the real interest differential equals the expected rate of change in the real exchange rate, plus a risk premium (which may be positive or negative):

$$(5) \quad r - r^* = \frac{\Delta}{e} + \rho$$

The expected rate of exchange rate change, in turn, is assumed to be proportional to the distance from a perceived long run equilibrium rate:

$$(6) \quad \hat{e} = \theta(\bar{e} - e)$$

B. International equilibrium

Equilibrium in this model can be easily analyzed by substituting the conditions of asset market equilibrium back into the goods market equations. From (5) and (6), we have the real exchange rate equation

$$(7) \quad e = \bar{e} - \theta^{-1}(r - r^* - \rho)$$

This may be substituted into (2) and (3) to yield equilibrium conditions for the US and ROW markets defined in terms of r and r^* .

These equilibrium schedules are shown in Figure 1 as UU and RR. Their slopes may be understood as follows. A rise in r creates an excess supply of US goods, for two reasons. First, it directly reduces spending by US residents; second, it leads to an exchange rate appreciation which makes US goods less competitive. To offset this and restore US goods market equilibrium, r^* must rise by more than r , so as to convert the exchange rate appreciation into a depreciation which increases the US trade surplus, offsetting the demand effect of a higher interest rate. Thus UU is an upward - sloping line which is steeper than the line $r = r^*$. Similar reasoning implies that RR is also upward - sloping, but flatter than $r = r^*$. By doing the algebra, we find that the slope of UU is

$$\frac{\delta - \gamma\theta}{\theta} > 1$$

while that of RR is

$$\frac{\delta^*}{\delta^* + \gamma^*\theta} < 1$$

It is assumed in the drawing of Figure 1 that the initial equilibrium is

one in which interest rates are equal.

In addition to these schedules, we also show for reference the schedule WW. This line represents points where world spending and income are equal. It can be derived from (2), (3), and (4), which yield

$$(8) \quad \sigma\gamma(r - \bar{r}) + (1 - \sigma)\gamma^*(r^* - \bar{r}^*) = \sigma z + (1 - \sigma)z^*$$

II. Comparative Statics

We are now in a position to consider the effects of shifts in the three exogenous variables z , z^* , and ρ .

A. A shift in z

An expansionary US fiscal policy may be represented by an increase in z . The effects of such an expansion are represented in Figure 2. The increase in z shifts the UU schedule to the right (and also shifts WW outward). The result, illustrated by the move from E to G, is a rise in both r and r^* ; but r rises more than r^* , so that e falls. That is, an expansionary US fiscal policy leads to an interest differential and real exchange rate appreciation.

To understand the result, it is useful to imagine a hypothetical sequence of events, although in fact the adjustments occur simultaneously. First, we ask what would happen in the US with a constant exchange rate. In that case, all of the crowding out effects would have to occur through a rise in US interest rates, so r would rise to the level indicated by point F. The rise in r would, however, create an incentive for capital inflows to the United States, leading to an exchange rate appreciation (a fall in e). This appreciation would have three effects. First, by reducing the demand for US goods, the appreciation lowers r . Second, by raising the demand for ROW

goods, the appreciation raises r^* . These effects together of course reduce the interest differential $r - r^*$. Finally, the appreciation sets up expectations of a future depreciation. The appreciation continues until the narrowed interest differential is offset by the expected depreciation, so that expected returns are equal. This occurs at point G.

A point stressed by Feldstein should be clear from this description. If capital inflows were prevented, and the real dollar kept from rising, the domestic interest rate would have to rise more than it does in fact. This may be thought of in several ways. One is to say that capital inflows help finance the US budget deficit. A second is to argue that the appreciation of the dollar reduces the demand for US goods. A third is to note that the rise in ROW interest rates induces foreigners to release resources to the US. These are all different ways of viewing the same process.

We might also note that if the market does not expect a return to some normal real exchange rate, the dollar must appreciate enough so that r and r^* rise by the same amount. This outcome, illustrated by point H, is the case of completely global crowding out: the interest rate impact of a fiscal expansion does not depend on its country of origin. Note that even in this case not all of a budget deficit will be financed by capital inflows, because the US is large enough to influence world interest rates.

B. A shift in z^* (ROW fiscal policy)

Suppose that ROW shifts towards tighter fiscal policy. We can represent this as a fall in z^* , and illustrate the effects of Figure 3. The schedule RR shifts in, and so does WW. Interest rates fall in both ROW and the US;

but r^* falls more than r , so that e falls (the US experiences a real appreciation).

In its effect on the exchange rate, then, foreign fiscal contraction reinforces domestic fiscal expansion. The fiscal explanation of the strong dollar thus hinges on fiscal divergence.

C. A fall in ρ (safe haven effect)

The US Treasury Department and others do not accept the fiscal explanation of the strong dollar, arguing instead that political uncertainty abroad and increased confidence in US policy have led to capital inflows. In our model this can be represented by a fall in ρ , whose effects are illustrated in Figure 4.

At any given r and r^* , the fall in ρ would lead to a fall in e , and thus to an excess supply of US goods and an excess demand for ROW goods. To eliminate the excess supply of US goods, for any given ROW interest rate the US rate must fall; so UU shifts left. To eliminate the excess demand for ROW goods, for any given US interest rate the ROW rate must rise; so RR shifts up. The new equilibrium must however still lie on the world spending-equals-income locus WW, which has not shifted. Thus the equilibrium shifts northwest from E to F.

We can immediately see that r falls and r^* rises (since this is counterfactual, the safe haven effect cannot have been the whole story). What about the exchange rate? Here we simply note that the fall in r will lead to an excess of spending over income, which must have a trade deficit on its counterpart; thus e must fall.

III. A Back-of-the-Envelope Calculation

The model we have laid out has only a few parameters, which makes it tempting to plug in plausible values and see what happens. This note concludes with a back-of-the-envelope calculation of the impacts of expansionary US fiscal policy.

As an initial simplification, let us assume that $\gamma = \gamma^*$: a one percentage point rise in the real interest rate reduces spending by the same share of GNP in both the US and ROW. This then leaves us with only four parameters: γ ; σ , the share of the US in gross world product; δ , the improvement in the US trade balance as a percentage of GNP resulting from a one percent exchange rate depreciation; and θ , the fraction of the deviation from the long run real exchange rate which the market expects to be eliminated in each year.

In an illustrative calculation, I will assign the following values to these parameters:

$\sigma = 0.4$: The US has about 40 percent of the OECD's GNP. Admittedly, the US can crowd out demand in developing countries as well; on the other hand, some OECD countries, such as France, maintain capital controls which break the link between their interest rates and the world capital market.

$\delta = 0.1$: This number is roughly consistent with econometric trade equation estimates, and is also what you would expect if export and import demand elasticities were both unity.

$\theta = 0.1$: To explain the dollar's rise by interest differentials, one needs to assume that a one percent real interest differential produces a ten percent real appreciation (Frankel 1985).

$\gamma = 0.5$: This is the least well-founded parameter. It is chosen to be roughly consistent with the past - 1980 experience.

Solving our model algebraically under the assumption $\gamma = \gamma^*$, we have

$$\frac{dr}{dz} = \frac{(1-\sigma)\gamma + \sigma\delta\theta^{-1}}{\gamma[(1-\theta)\gamma + \delta\theta^{-1}]} = 1.06$$

$$\frac{dr^*}{dz} = \frac{\sigma\delta\theta^{-1}}{\gamma[(1-\sigma)\gamma + \delta\theta^{-1}]} = 0.6$$

$$\frac{d(r-r^*)}{dz} = \frac{1-\sigma}{(1-\sigma)\gamma + \delta\theta^{-1}} = 0.46$$

$$\frac{d\varepsilon}{dz} = \frac{-(1-\sigma)\theta^{-1}}{(1-\sigma)\gamma + \delta\theta^{-1}} = -4.6$$

Also, let us define b as the US trade balance as a share of GDP. Then

$$\frac{db}{dz} = -.46$$

That is, 46 percent of the "crowding out" from a budget deficit takes the form of a deterioration of the trade balance rather than a reduction in domestic spending.

To get a feel for the meaning of these numbers, suppose US fiscal policy were to grow more expansionary by the equivalent of 5 percent of GNP. Then our model tells us that

- (i) US real interest rates rise by 5.3 percentatge points;
- (ii) Foreign interest rates rise by 3.0 percentage points;
- (iii) The interest differential widens by 2.3 percentage points;
- (iv) The real dollar appreciates by 23 percent;
- (v) The US trade balance worsens by 2.3 percent of GNP.

We can also note that if capital controls were to prevent a rise in the dollar, a one percentage point fiscal stimulus must raise r by $1/\gamma$ percentage points, so that our fiscal stimulus would have raised r by 10 rather than 5.3 percent.

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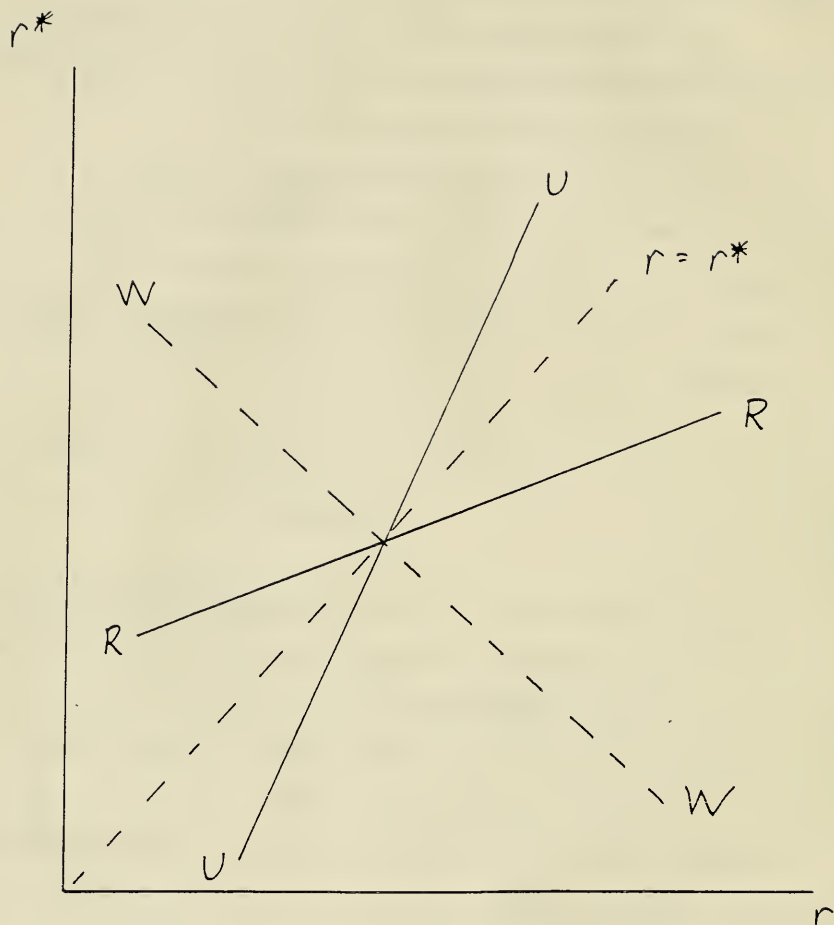


Figure 1

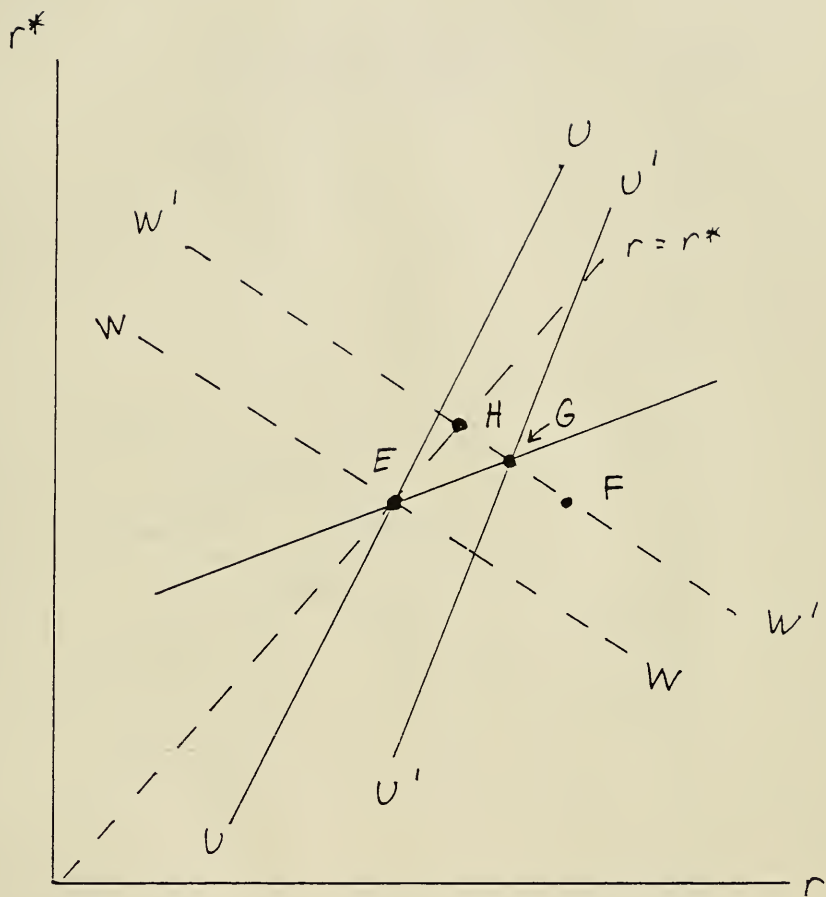


Figure 2

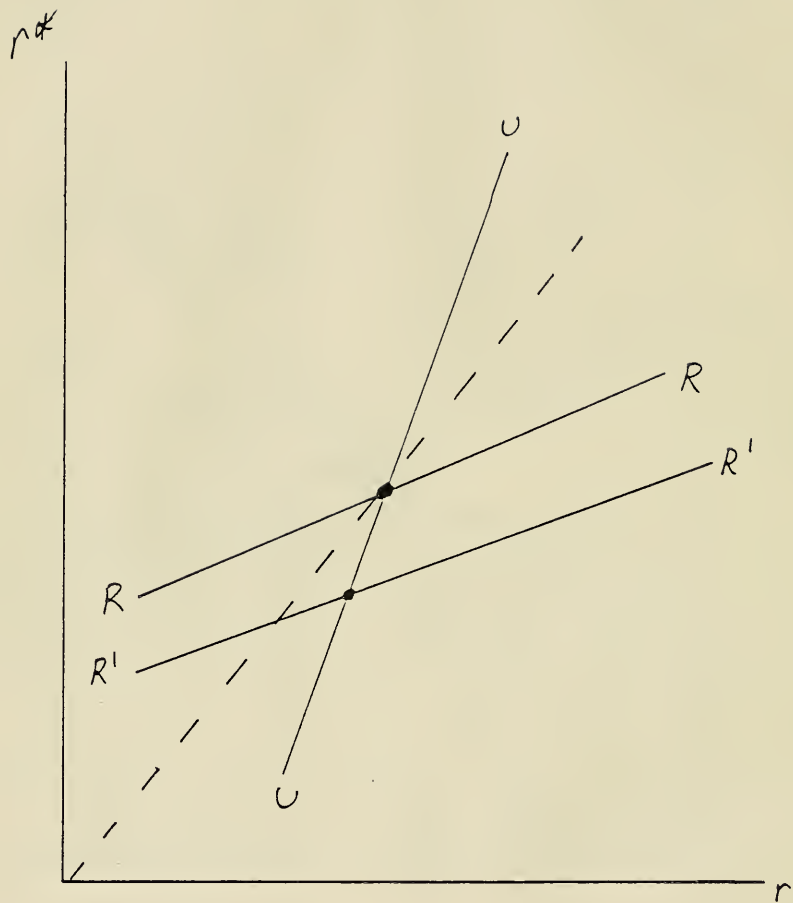


Figure 3

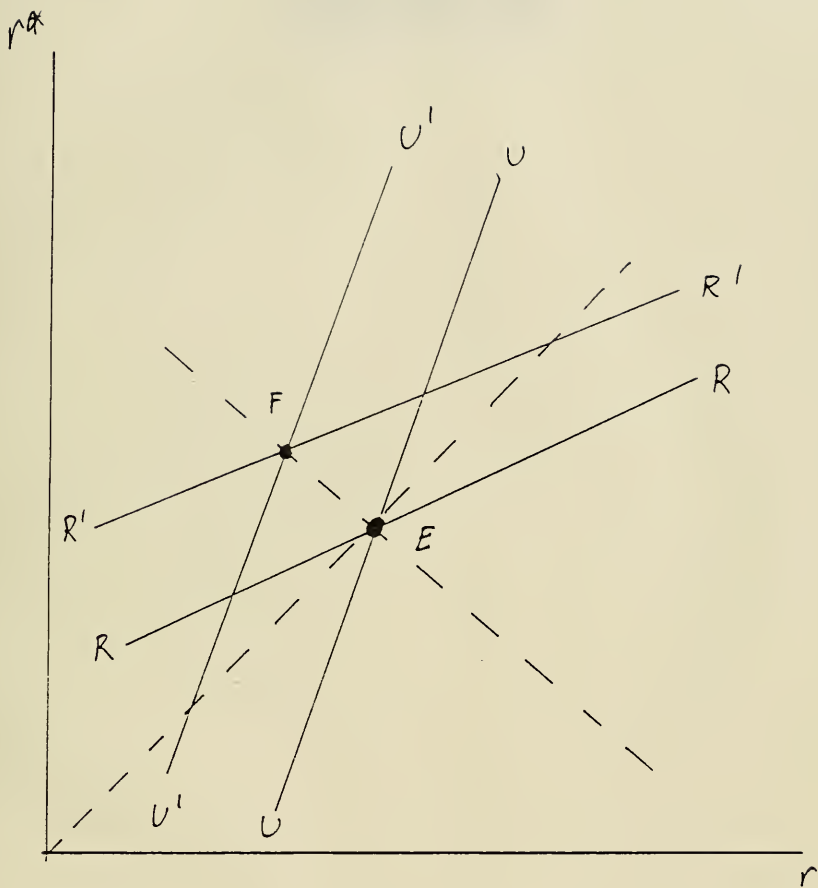


Figure 4

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